Stress and stress reduction to prevent preterm birth

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Overview

- Stress and preterm birth (PTB) / Low birth weight (LBW)
  - Biological plausibility
  - Epidemiological plausibility
  - Partial explanation for racial disparities

- Systematic review of stress reduction interventions to prevent PTB/LBW infants

Preterm birth (PTB) and Low birth weight (LBW)

- Major cause of perinatal mortality
- Leading cause of infant morbidity
- Rate in US has been decreasing since 2006
- But still higher than other industrialized countries

Preterm birth (PTB) and Low birth weight (LBW)

Stress and PTB

One potential contributor to PTB is chronic stress:
- through direct physiologic mechanisms
- through behavioral pathways

Drug use  
Nutritional intake  
Prenatal care
Stress
Process of stimulus, appraisal of it and response

Stimuli or stressor
Appraisal

- Found to be threatening/unmanageable
- Psychological state of stress

Cascade of biological and behavioral adjustments

Biologic plausibility

- Chronic stress down regulates function of T and B lymphocytes
  - Decreased proliferation, differentiation and cytotoxicity
- Increased host resistance to viral pathogens and some bacteria
- May act as co-factors precipitating PTB

Biologic plausibility - HPA Axis

Epidemiologic plausibility

- Recent review of over 80 investigations that have shown a link between self reported maternal stress and PTB/LBW
  - Dunkel Schetter 2011
- Other studies have not shown this association
Epidemiologic plausibility Discrepancies

• Definition of stress
• Measure of stress
  • Stressful life events
  • Anxiety
  • Depression
  • Stressful work
  • Physical abuse
  • Perceptions of neighborhood discrimination
  • Low levels of social support
• Focus on isolated stressful life events
  – Minimal threat/quick resolution

Office of the Surgeon General and NICHD

Recommended further research into resolving pregnancy related stress and anxiety through interventions that will likely need to be varied based on differences in ethnic, cultural and socioeconomic status

Racial disparities in PTB

• Chronic stress may explain some of the racial disparities in PTB rates


Why racial differences?

Two models of chronic stress

– Life-course theory
  (Lu and Halfon, 2003, Kingston 2012)

– Weathering
  (Geronimus 1997)

Life-Course Theory

• Racial disparities in LBW reflect pre-pregnancy prevalence among AA women of
  – Greater contextual risk factor
  – Less protective variables

• Pregnancy outcome influenced through two mechanisms
  – Early life (fetal) programming
  – Cumulative wear and tear (weathering)

Weathering

• Risk of PTB/LBW for AA monotonically with advancing age
  – Not extremes of age like in Non-Hispanic white women
    (Geronimus 1996, Collins 2006, Borders 2007)

• Conceptualization of the physical consequences of social inequality on pregnancy outcomes

• Limited to AA women with lifelong residence in low-income urban neighborhoods (Collins 2009)
Race and PTB

“By assuming that racial disparities in PTB are a result of numerical differences in conventional risk factors, researchers and physicians overlook non-random, pervasive, and multifaceted inequality that is bound up in the historical context of race.”

David, 1991

Interventions to reduce maternal stress

<table>
<thead>
<tr>
<th>Potential stressors</th>
<th>Potential interventions</th>
</tr>
</thead>
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<tr>
<td>Financial problems</td>
<td>Improved patient support and education in the clinical setting</td>
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<tr>
<td>Neighborhood conditions</td>
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<td>Discrimination</td>
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<td>Strain in intimate relationships</td>
<td>• home visitation</td>
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<td>Employment conditions</td>
<td>• Teaching stress reduction and improved coping mechanisms</td>
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<td>Pregnancy related concerns</td>
<td></td>
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(Dunkel Schetter, 2011)

Objective

• Studies that:
  - Looked at decreasing stress
  - Had preterm birth as outcome
  - Or had Low birth weight (<2500g, ~ 5 ½ lbs) as outcome

Methods:

Search Strategy
• Fall 2013, Published after 1980
• MEDLINE, OVID and PUBMED databases using a combination of keywords and MeSH terms
• NIH clinical trials:
  - preterm birth, prematurity or low birth weight that related to stress and stress reduction.
• References reviewed to assess for other publications not found with the original search.

Methods

Study selection criteria
• Titles reviewed for relevance to study question
• Abstracts reviewed to see if met criteria for inclusion:
  1) there was a formalized attempt to decrease prenatal stress or provide additional prenatal support before birth
  2) the outcome studied was preterm birth or low birth weight.

Data abstraction
• Reviewed for:
  - study design
  - number of participants
  - Intervention
  - outcomes and findings
    • including any attempts to control for confounding factors.
Care Coordination
8 articles (2 RCTs, 3 Cohort, 3 Observational)

- Promising but mixed results
- Some studies suggest reduction in PTB and LBW—particularly in minority groups
- May be in part due to heterogeneity in what is considered care-coordination
- Unclear how much is related to stress reduction (not specifically measured)

Group prenatal care/CenteringPregnancy™ (CP)

- Reduction in maternal stress through education, social and emotional support.
  (Ickovics 2007, Kennedy 2009)

CP has been linked to:
- Fewer feelings of being alone
- Higher satisfaction with care
- Lower risks for postpartum depression.

RCT looking at CP in high-stress women reported:
- Significantly increased self-esteem
- Decreased stress and social conflict
  (Ickovics 2011)

CenteringPregnancy™

- Relationship-centered model for PNC
- Women are empowered through peer support to:
  - Participate
  - Learn
  - Make informed decisions
  - Self-manage
- Groups of 8-12 women with ~EDD
- 10 visits/2 hrs a session
- Educational curriculum through facilitated discussion

Frankel 2004
CP and PTB/LBW
11 articles (3 RCT, 5 cohort, 2 observational, 1 meta-analysis)
- Majority of studies showed decreased rates of PTB/LBW compared to traditional PNC
- Studies performed:
  - In public health clinics, with Medicaid eligible or low SES women.
  - In settings predominantly serving minority patients including African Americans, Hispanics.
- Appears to
  - Be effective in high-risk groups such as teenagers
  - Be effective after translation into Spanish
  - To diminish racial and ethnic disparities for PTB
- Outcomes maybe due to three aspects of the intervention:
  - Enhanced education empowering women to seek medical attention earlier
  - Better communication leading to improved compliance
  - Enhanced levels of social support helping low-resource women with stress coping

(Prickett et al., 2012)

Other group PNC
- Peer mentors and group care with care coordination.
  - No difference (Ford 2002, Willis 2004)
- "RCT" of group PNC in Iran
  - No difference (Jafar 2010)
- Meta-analysis (2 RCTs, 4 Cohort Studies, 3242 women)
  - Reduce the rates of PTB (RR 0.71, 0.52-0.98)
  - No difference in LBW (RR 0.91, 95% CI 0.65-1.27)
  - (Ruiz-Mirazo, 2012)

Titles from search
330
Abstracts reviewed
139
Articles included
47
- Care coordination 8
- Group prenatal care 11
- Expansion of public health insurance 4
- Expanded prenatal education/support 5
- Teaching stress reduction strategies 3
- Clinic visits 8
- Home visitations 9
- Telephone contact 2

Expansion of public health insurance
- Likely includes other interventions (care coordination/home visits)
- Shown to decrease symptoms of depression and financial strain (Baker, 2013)
- Few studies looking at PTB/LBW
  - New York State Prenatal Care Assistance Program
  - Washington state
  - California

Increased prenatal care education/support
Clinical setting
- 8 Articles (5 RCTs, 1 randomized intervention, 1 cohort, 1 observation)
- One study in 1970s/1980s in E. France used risk-scoring system and targeted activity counseling showed decreased PTB over next decade (Papiernik, 1985)
- Other studies found no decrease in LBW/PTB
Increased prenatal care education/support

Home visitations

- 9 Articles (8 RCTs, 1 Cohort)
- Nurse-family partnership (NFP)
  - Evidence-based, national health program partnering with local organizations
  - Two studies, one showed reduction in PTB (Olds 1986, Kitzman 1997)
- 1 RCT- 25% reduction in PTB and larger reduction in twin PTB (Brooksbank 2001)
- 3 other RCTs no decrease in PTB (Kitzman 1997, Villar 1992, Blondel 1990)
- May reduce PTB in certain subsets
  - Smokers (Olds 1986)
  - Australian women with poor OB histories (Bryce 1991)
  - Unmarried teenagers (Prigge 1996)
- May reduce LBW in certain subsets
  - Low-support African American women (Harbeck 1996)

Increased prenatal care education/support

Television interventions

- Retrospective cohort where women received daily calls-No difference (Brooksbank 1996)
- More recent study
  - No overall reduction in PTB or LBW
  - Subgroup of black women>18
    - 44% decrease in PTB
    - 34% decrease in LBW
  - Cost-benefit perspective $117/pregnancy would provide ~$17,000 in economic benefit
    (Moore 1998, Muender 2000)

Teaching stress reduction strategies

- One-on-one stress reduction sessions
  - Guided imagery via audiotape 3 x week
  - Decreased stress (PSS)
  - Increase mean birth weight and GA vs controls
    (Wesley 2006)
- Applied relaxation (7 sessions, Iran)
  - Reduction in LBW
  - No change in PTB
    (Bastani 2006)
Mindfulness Practices and Yoga

- Systematic review of mind-body interventions (Beddoe 2008, 2009)
  - Methodological problems
    - (no randomized control group, no controlling for confounders)
  - Higher birth-weights
  - Reduced perceived stress/anxiety

- Iyengar Yoga and mindfulness stress reduction vs. walking (Narendran 2005)
  - Decrease in PTB (14 vs 29%, P=0.0006)
  - Decrease in LBW (19 vs 31%, P=0.01)
  - However, randomization flawed, no control for prior PTB/other risk factors

Conclusions

- Chronic stress contributes PTB
  - Direct physiologic mechanisms
  - Behavioral pathways

- Current literature on stress reduction
  - Studies heterogeneous
  - Mixed findings

Increased Education and Social support

- in the clinic setting does not appear to affect PTB or LBW

- Home visitation appears to be beneficial to certain groups (high-risk patients, smokers, unmarried teenagers)

- Telephonic support appeared to be beneficial for a subgroup of patients (black women over 18)

Care Coordination/Case Management

May be beneficial to reduce PTB and LBW rates particularly in minority groups

Expansion of public health insurance

Results are mixed, hard to tease out which aspect of expanded services was associated with improvements
Other stress reduction strategies

- reduce stress during pregnancy
- unclear that specific interventions decrease the rate of PTB and LBW outcomes for all low-risk women
- may show increased benefit for specific groups (e.g. teenagers, low support women, or racial minorities).

Group prenatal care

- most evidence showing an association with PTB and LBW prevention.
  - CP:
    - decrease self-reported maternal stress
    - significant increases in self-esteem, decreased stress and social conflict during the third trimester of pregnancy
  - The consistent, positive findings of the CP model suggest that it is .... the reduction in maternal psychosocial stress through social support and self-efficacy training.

Conclusions

- Given the heterogeneity of results, further research is needed:
  - to assess the efficacy of interventions designed to prevent PTB through reduction in maternal stress
  - to understand the components of CP that contribute to improved outcomes
  - to understand the behavioral and biological processes underlying outcomes

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Questions?